

## Traffic Count Comparisons (Traffic Impact Analysis Projections vs. Reality)

This paper analyzes the accuracy of the traditional TIA methodology as it pertains to the redevelopment of North Hills over time, and more generally the accuracy of the TIA methodology with urban infill projects.

### Background

The existing North Hills development in Raleigh, NC sits on the north side of the I-440 interchange bisected by Six Forks Road which is a six-lane divided roadway. The North Hills development started out as an enclosed shopping mall surrounded by vehicular surface parking opening in 1967. It was the first mall of its kind in Raleigh and operated this way for 36 years.



Exhibit 1: North Hills Shopping Mall – June 2002

*Photo Credit: City of Raleigh – April 26<sup>th</sup>, 2022 Planning Commission*

The redevelopment of the North Hills mall began in 2001. This redevelopment has taken the North Hills mall from a suburban style mall to a mixed-use urban district containing multifamily residential buildings, office towers, urban style ground-floor retail and restaurants, as well as larger stand-alone retail stores such as Target and REI. The buildings today in North Hills as well as those currently under construction or planned range in height from a single story to almost 40 stories. This redevelopment of the original North Hills Mall is still ongoing today.

Multiple Traffic Impact Analyses (TIAs) have been performed over time for the various phases of the North Hills redevelopment. The typical TIA methodology is to project impacts that new developments will have on the surrounding roadway network during the morning and afternoon peak hours based on expected new traffic entering and exiting the development.



Exhibit 2: North Hills – November 2021

*Photo Credit: City of Raleigh – April 26<sup>th</sup>, 2022 Planning Commission*

The standard TIA methodology consists of a few steps but can vary between states, counties, and municipalities. Morning and afternoon peak hour traffic counts are performed to establish a baseline existing traffic condition. These existing traffic volumes are then grown at a certain rate to account for growth in traffic due to general traffic growth in the area. The growth rate is typically agreed upon by the preparer of the TIA and review organization. Additionally, the projected peak hour traffic from TIAs performed for other nearby developments are added on top of this background growth. All of these traffic volumes are added together to establish a future year baseline traffic condition. This future year baseline condition does not include the projected site traffic from the development of interest.

Finally, peak hour trip generation is then performed for the development based on the proposed land use intensities (number of residential units, office square footage, retail square footage, hotel rooms, etc.) usually using data that is provided by the Institute of Transportation Engineers (ITE) for various land uses to determine how much traffic is expected to enter and exit the new development in the peak hours.

ITE provides guidance on how to estimate internally-captured traffic within the development. Internal capture represents trips between different use types within the development (i.e. residential and retail). These internally-captured trips are subtracted from the overall total new trips entering and exiting the site since they only enter the site once but visit at least two uses within the site. Another reduction is taken for what is called a “pass-by trip,” which is a vehicular trip that is already on the adjacent road system that is anticipated to now enter and exit the site. An example of this is if a new grocery store were to be built along a driver’s typical commute between work and home that is closer than the grocery store he or she typically shops at. The commuter may now go to this grocery store instead of the other one since it is already along their commute, so they now enter and exit the site instead of continuing through on the adjacent or nearby roadway. This is not a new trip to the network overall, but it is a new turning movement at the site driveway. These trips are also subtracted from the overall trip generation, similar to internal capture. This projected new site traffic (after internal capture) is carried throughout the study network, and added on top of the future year baseline traffic volumes. The assignment of site trips to the street network is typically based on existing traffic patterns, location of complimentary land uses (i.e. location of employment centers for new residential development), routes to highways/freeways, and other available information. An exhibit showing the standard process of projecting build-out traffic volumes is shown below.

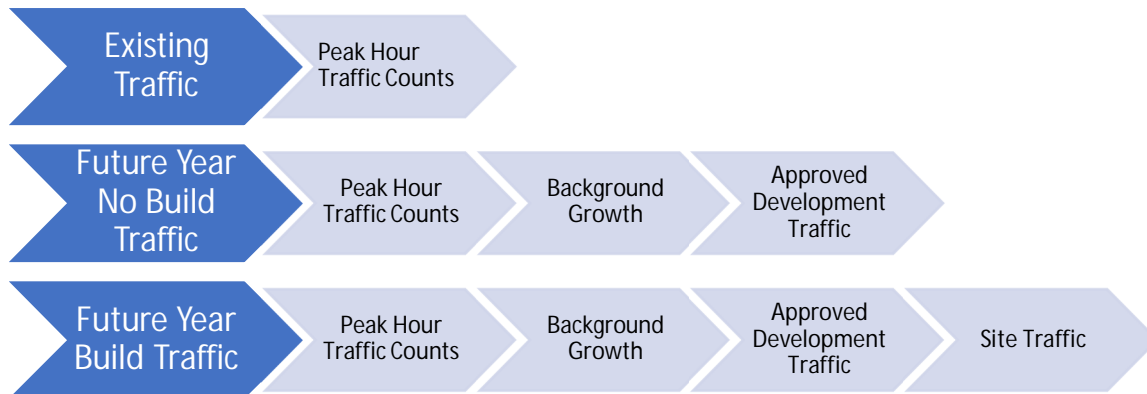


Exhibit 3: Standard TIA Volume Development

These volumes are analyzed with traffic analysis software to determine projected Level of Service (LOS) for the study intersections. Levels of Service are established in the Highway Capacity Manual (HCM) and consist of letter grades A-F depending on how much delay a vehicular user is projected to experience at each intersection. In this criteria LOS A is the best (least delay) and LOS F is the worst (most delay). Review agencies will establish lowest acceptable LOS thresholds (typically LOS E and LOS F but can vary) and if an intersection is projected to have an unacceptable LOS, then developments may be required to reduce development intensity, or mitigate the intersection for vehicular users. This vehicular mitigation is typically done by widening roads or adding turn lanes to the intersection which increases the geometric footprint. These types of mitigations typically degrade the safety and attractiveness/desirability for alternative modes of transportation such as walking and cycling by increasing crossing distances for these modes.

Investigation

There have been three (3) TIAs performed during the redevelopment of North Hills in the last 17 years. These TIAs and the development plans they analyzed are listed below:

- *North Hills East TIA* (Kimley-Horn, December 2005)
  - 950,000 square feet (SF) of office
  - 280,000 SF of retail
  - 1,400 multifamily residential units
  - 300 senior living units
  - 210-room hotel
- *North Hills East Rezoning TIA* (Kimley-Horn, November 2016)
  - More commonly referred to as *North Hills PD*
  - 2,475 multifamily residential units
  - 225 congregate care units
  - 1,100 hotel rooms
  - 2,014,479 SF of office space
  - 161,591 SF of retail space
  - 130,779 SF of restaurant space

- North Hills Mixed-Use TIA (Kimley-Horn, December 2019)
  - Replacing a 169,524 SF JCPenney department store with:
    - 365,000 SF of office space
    - 125,000 SF of retail space
    - 430 multifamily residential units

It should be noted that the *North Hills PD TIA* included traffic from the *North Hills East TIA* as approved development traffic, and the *North Hills Mixed Use TIA* included traffic from the *North Hills PD TIA* as approved development traffic in the analyses.

Exhibit 4 shows the parcels associated with each of the TIAs.



Exhibit 4: TIA Locations

The estimated vehicular site traffic trip generation from each of the TIAs that were performed are shown below in [Table 1](#).

Table 1 Site Traffic Generation Estimation (Vehicles) – North Hills TIAs						
TIA	Daily		AM Peak Hour		PM Peak Hour	
	In	Out	In	Out	In	Out
North Hills East	9,293	9,293	1,137	535	708	1,241
North Hills PD	8,932	8,932	1,462	754	843	1,573
North Hills Mixed-Use	N/A*	N/A*	201	-13	17	231

\*No daily traffic generation estimate provided in TIA

As shown above in [Table 1](#), the TIAs that have been performed suggest that the development that has been constructed, is currently under construction, and is yet to be constructed would significantly increase the daily and peak hour traffic around North Hills.

The overall development plan for North Hills East has almost been completely built out, and the first multifamily project in North Hills PD (Vine North Hills Apartments) is open and occupied at the time of the writing of this paper. The North Hills Mixed-Use development is under construction as of this paper's writing. While the land use plans from the TIAs do not exactly match up with what has ultimately been constructed in North Hills East and North Hills PD, there has still been a significant amount of dense mixed-use development that has been constructed in the various districts comprising North Hills. The amount of development that has been constructed to date in North Hills East and the North Hills PD is shown below.

- 1,782 multifamily residential units
- 270 hotel rooms
- 1,215,979 SF office space
- 202,197 SF retail space

To compare the accuracy of the TIA methodology, the projected build-out traffic volumes for each of these TIAs were compared to daily and morning/afternoon peak hour traffic volumes that have been performed since 2004 or 2005 (depending on available data). These traffic counts were obtained from the North Carolina Department of Transportation (NCDOT), the City of Raleigh, and the aforementioned TIAs performed by Kimley-Horn.

### Findings

It was determined that the standard TIA methodology significantly overestimated traffic impacts to the surrounding roadway network over the course of the day as well as during the morning and afternoon peak hours in North Hills.

### Daily Traffic Volumes Comparisons

Daily traffic volume comparisons were performed at the following locations based on publicly available daily traffic data provided by NCDOT (which can be found [here](#)), as shown in Exhibit 5.

- Six Forks Road just north of Rowan Street
- Six Forks Road between Rowan Street and Lassiter Mill Road
- Six Forks Road between Lassiter Mill Road and Dartmouth Road
- Six Forks Road between Dartmouth Road and Front at North Hills Street
- Six Forks Road south of Ramblewood Drive
- Lassiter Mill Road between Six Forks Road and Pamlico Drive



**Exhibit 5: Daily Traffic Count Comparison Locations**

Table 2 below shows how daily traffic volumes have changed over time and how they were projected to increase from the *North Hills East TIA*. This was the only TIA used as it is the only one of the three discussed that has been significantly built out such that traffic from that development would largely be included in the counts presented in this analysis. A positive value in the “Difference (Projected – Actual)” column reflects an overestimation by the TIA while a negative value would reflect an underestimation by the TIA.

Location	Earliest Count (Year)	Latest Count (Year)	+/-	Projected Increase from NHE TIA	Difference (Projected – Actual)
Six Forks Road just north of Rowan Street	46,000 (2003)	43,000 (2019)	-3,000	4,275	+7,275
Six Forks Road between Rowan Street and Lassiter Mill Road	42,000 (2003)	42,000 (2019)	0	4,275	+4,275
Six Forks Road between Lassiter Mill Road and Dartmouth Road	43,000 (2003)	38,500 (2019)	-4,500	4,650	+9,150
Six Forks Road between Dartmouth Road and Front at North Hills Street	44,000 (2003)	54,000 (2017)	10,000	10,200	+200
Six Forks Road south of Ramblewood Drive	31,000 (2003)	27,500 (2019)	-3,500	2,800	+6,300
Lassiter Mill Road between Six Forks Road and Pamlico Drive	15,000 (2003)	16,000 (2017)	1,000	1,000	0

Graphs showing how the daily traffic volumes around North Hills have changed over time are attached.

Intersection Peak Hour Traffic Volume Comparisons

Intersection AM and PM peak hour traffic volume comparisons were also performed at the following locations comparing the projected build-out peak hour traffic volumes from the *North Hills East TIA* with actual counts over time:

- Six Forks Road at Rowan Street
- Six Forks Road at Lassiter Mill Road
- Six Forks Road at Dartmouth Road/Main Street at North Hills
- Six Forks Road at Front at North Hills Street/I-440 Westbound Ramps
- Six Forks Road at I-440 Westbound to Northbound Off-Ramp
- Six Forks Road at Ramblewood Drive/I-440 Eastbound On-Ramps
- Lassiter Mill Road at Currituck Drive
- Wake Forest Road at St Albans Drive

Table 3 below shows how the highest observed combined AM and PM peak hour traffic volumes compare to how they were projected to increase from the *North Hills East TIA*.

Intersection	Highest Observed Count (Date)	Projected from North Hills East TIA	Difference (Projected – Highest Observed Count)
Six Forks Road at Rowan Street	8,854 (1/21/2016)	10,837	+1,983
Six Forks Road at Lassiter Mill Road	9,892 (3/16/2005)	11,963	+2,071
Six Forks Road at Dartmouth Road/Main Street	9,677 (3/16/2005)	12,287	+2,610
Six Forks Road at Front at North Hills Street/I-440 Westbound Ramps	11,184 (5/29/2019)	13,893	+2,709
Six Forks Road at Ramblewood Drive/I-440 Eastbound On-Ramps	9,025 (5/29/2019)	10,679	+1,654
Six Forks Road at I-440 Westbound to Northbound Off-Ramp	7,193 (12/13/2012)	8,769	+1,576
Lassiter Mill Road at Currituck Drive	3,361 (5/29/2019)	N/A*	N/A
Wake Forest Road at St Albans Drive	9,801 (1/28/2016)	10,959	+1,158

\*Intersection not included in North Hills East TIA, so no combined AM and PM peak hour projection is available

Graphs showing how the observed combined AM and PM peak hour traffic volumes around North Hills have changed over time compared to what the North Hills East TIA projected are attached.

While some locations did have slight increases in vehicular traffic, most volumes remained relatively unchanged despite the amount of development that has been constructed over the past 10-15 years.

This could be caused by several factors, including but not limited to:

- People who used to live/work elsewhere in Raleigh and drive past North Hills now living, working, and/or shopping/dining in North Hills
- Drivers now choosing routes other than Six Forks due to all traffic generated by the new development
- More alternative mode trips such as walking in North Hills due to the decreased distance between trip generators and attractors, mix of land uses, and a highly walkable environment

Whatever the cause, this data suggests that the standard TIA methodology is not an appropriate analysis tool for future development in North Hills and similar types of urban infill developments. This is similar to what has been observed in places such as downtown Raleigh where vehicular traffic volumes have not significantly increased over the past 10-15 years despite the significant amount of development that has been constructed and occupied during that time.

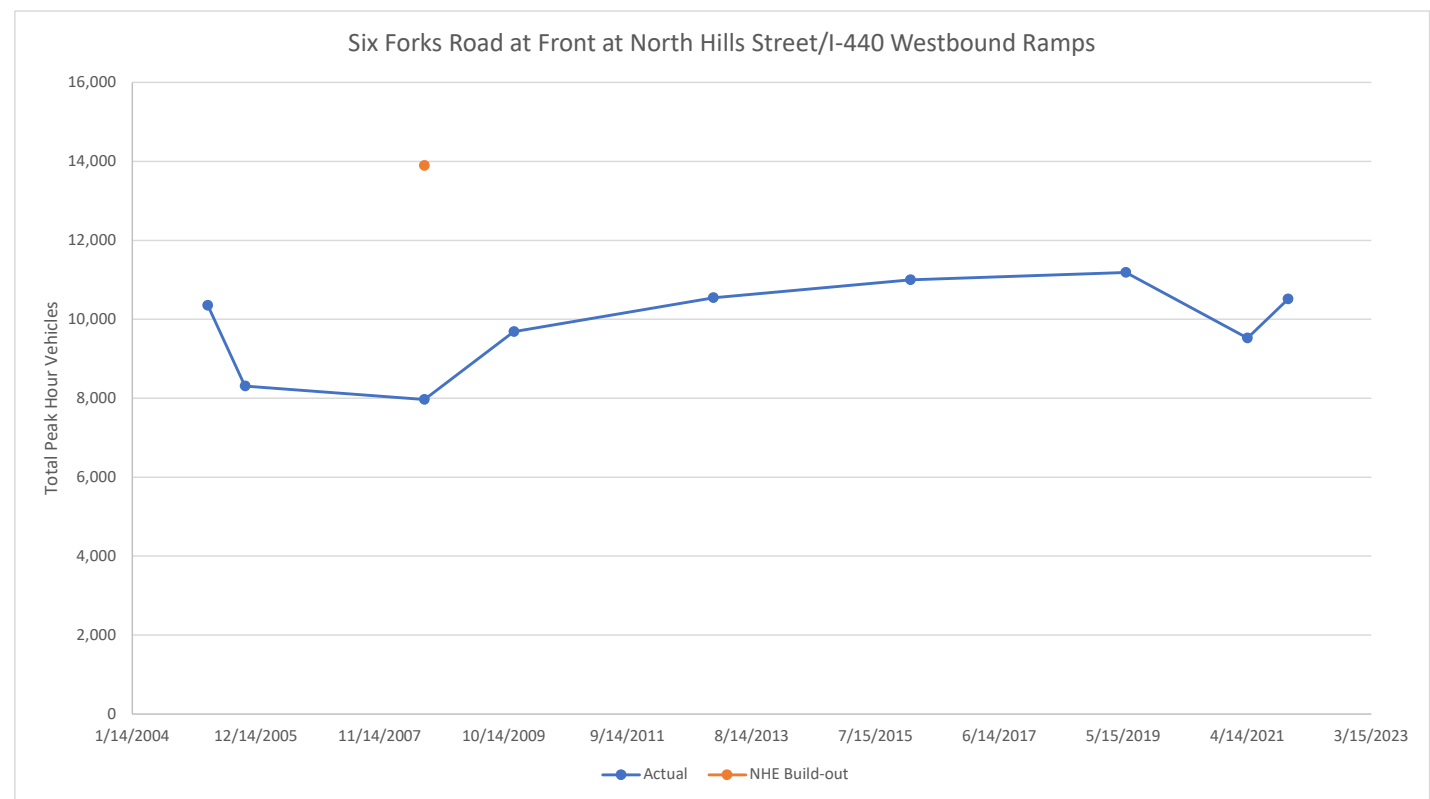
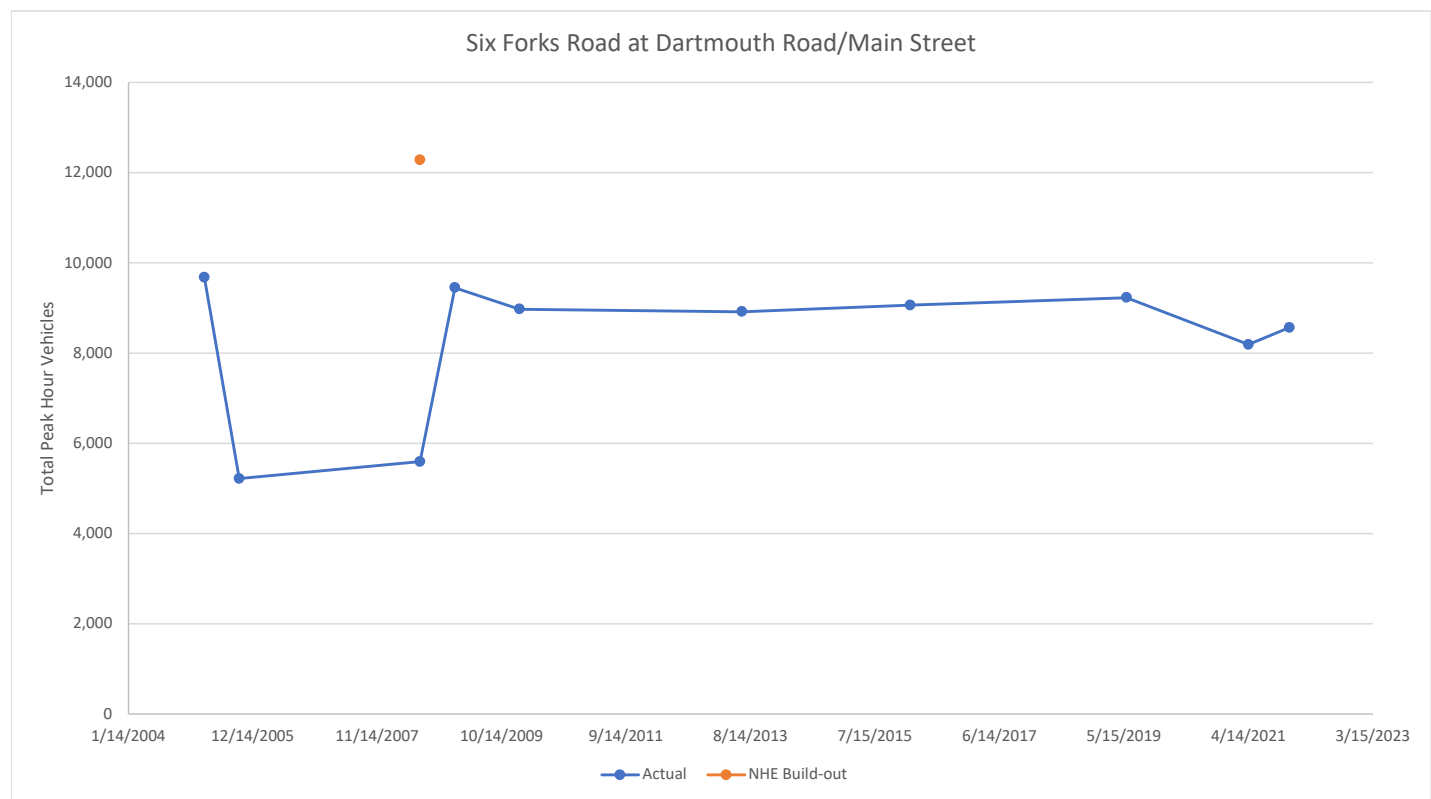
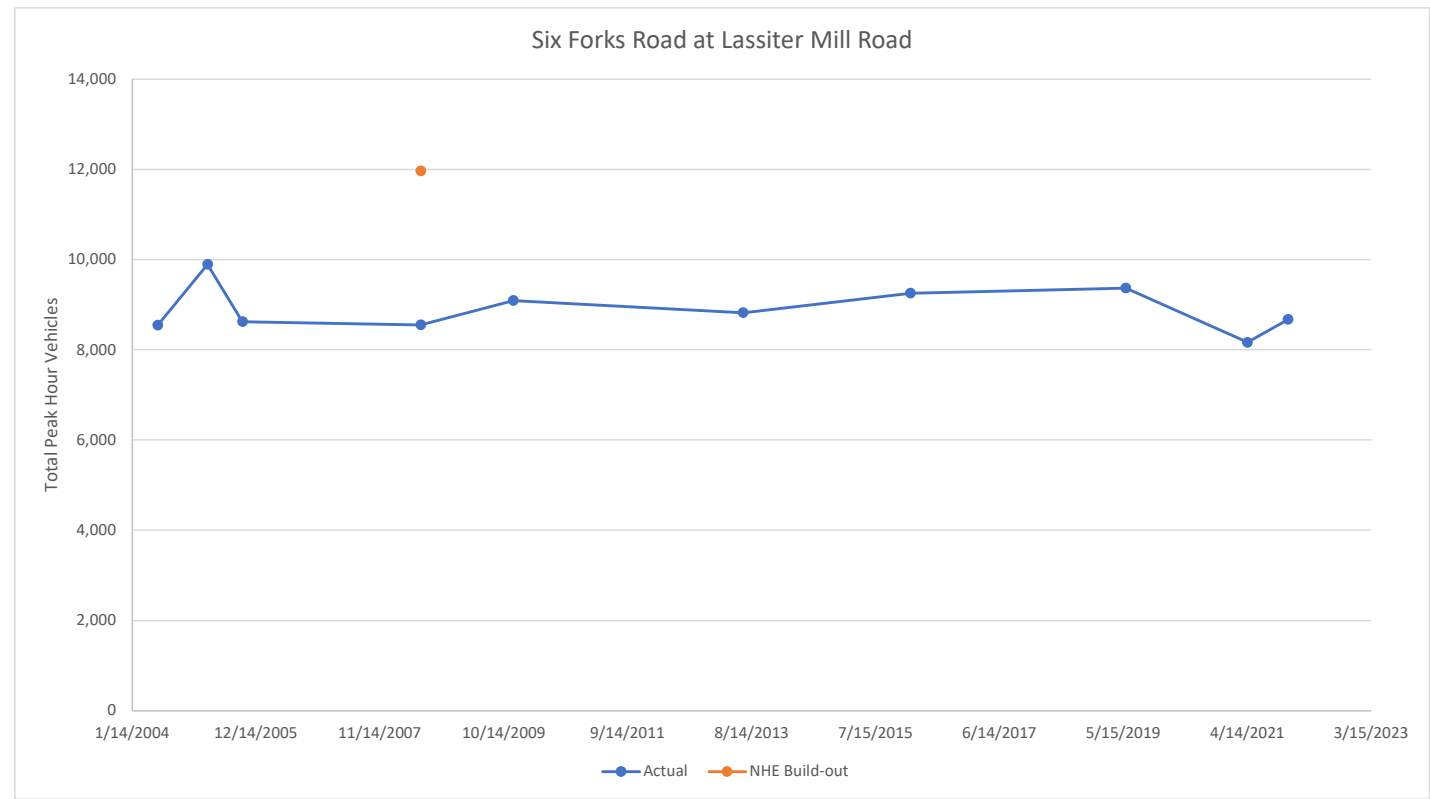
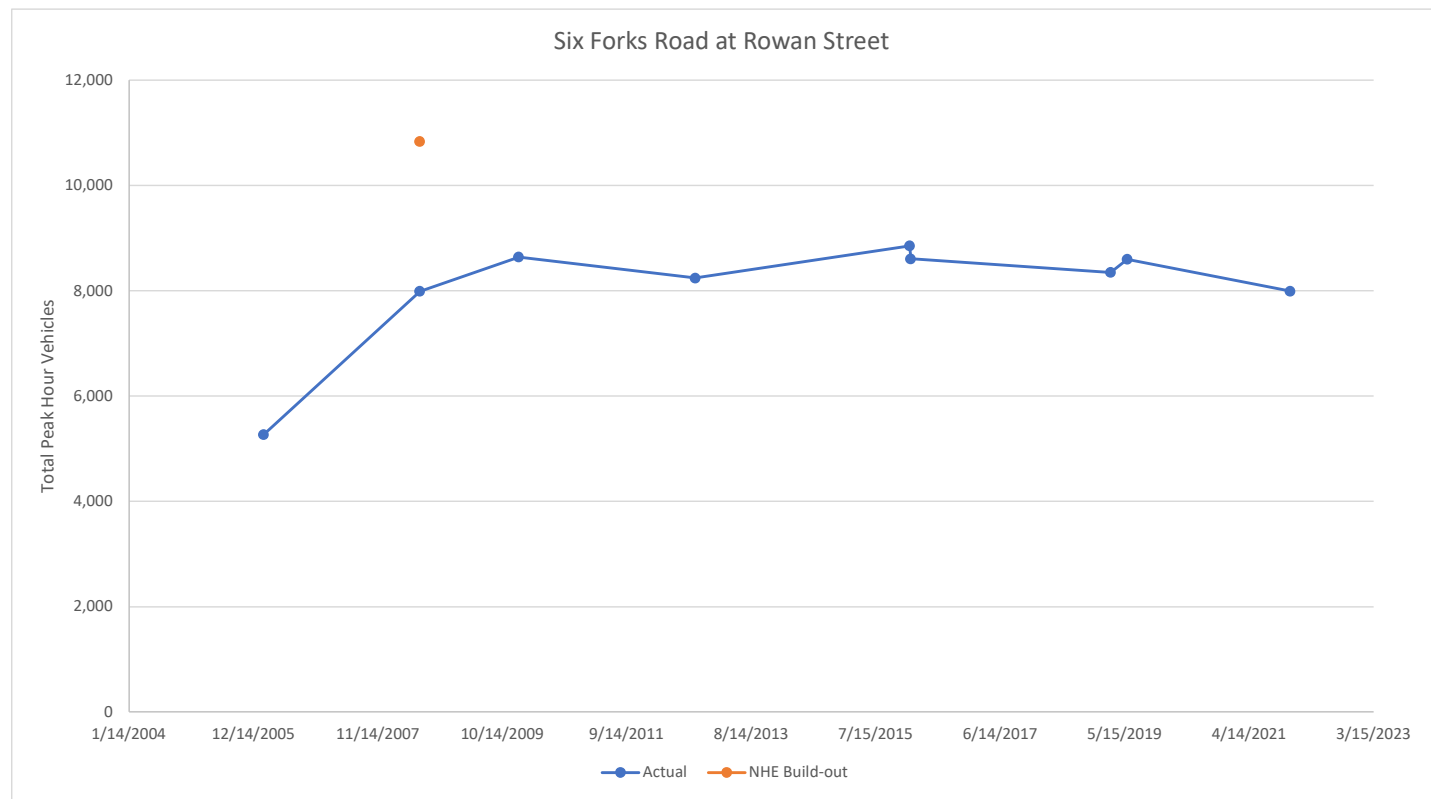


This paper focuses on the volume development aspect of the standard TIA methodology. More research needs to be done in other areas such as Level of Service and multi-modal trip generation to continue to understand the appropriateness and accuracy of the standard TIA methodology. Emerging analysis tools for new developments such as Vehicle Miles Traveled (VMT) analyses may be a better tool for urban infill projects and established or developing urban settings in general as it provides a more complete analysis of how the project may affect the whole transportation system of the region or municipality.

Continued monitoring of traffic volumes is recommended as North Hills continues to be redeveloped. A counter-analysis could also be developed to look at how traffic volumes change over time with a large single-use development (ex. Single family residential) in a more suburban setting in Wake County or one of the immediate surrounding counties.

Please reach out to Tyler O'Ferrell if you have any questions at [tyler.oferrell@kimley-horn.com](mailto:tyler.oferrell@kimley-horn.com) or 919-677-2120.

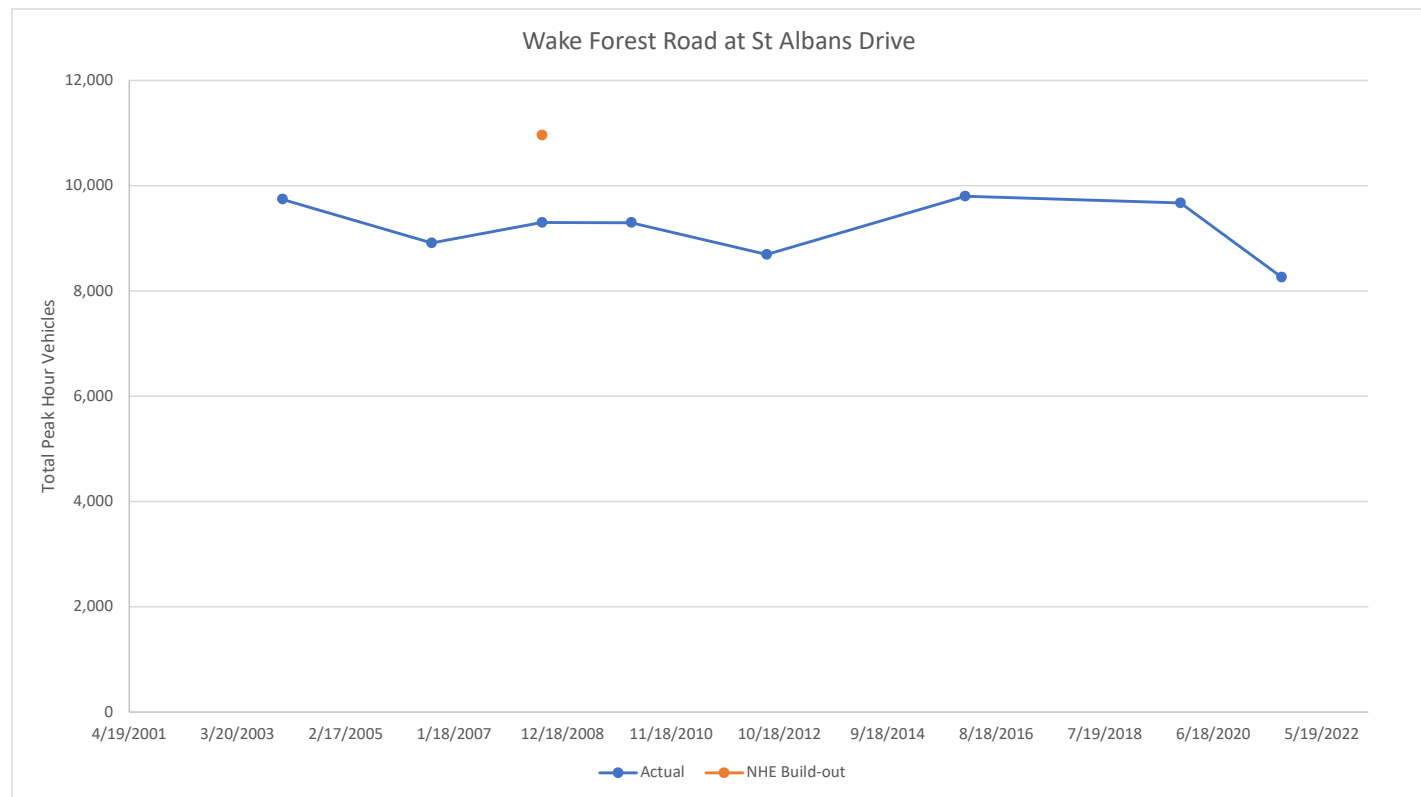
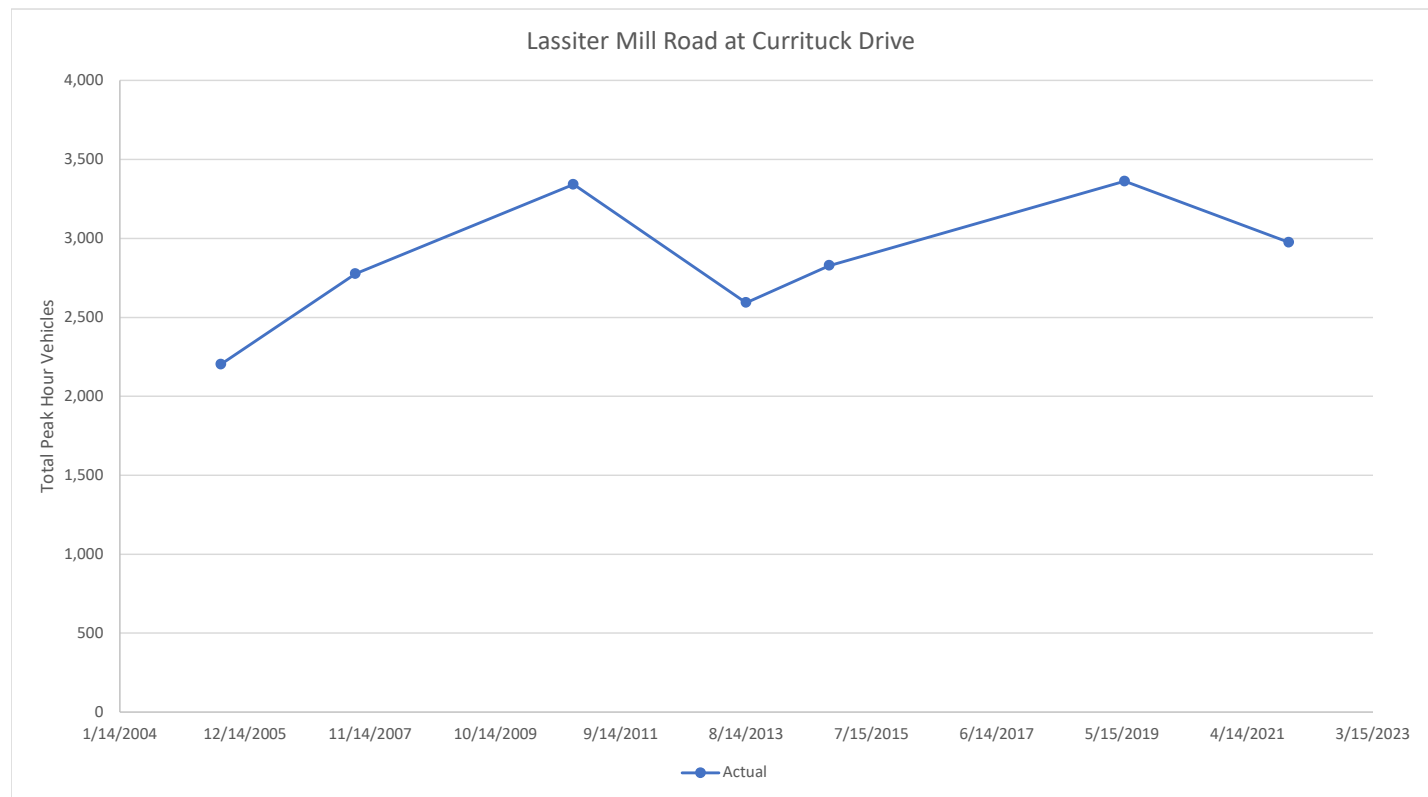
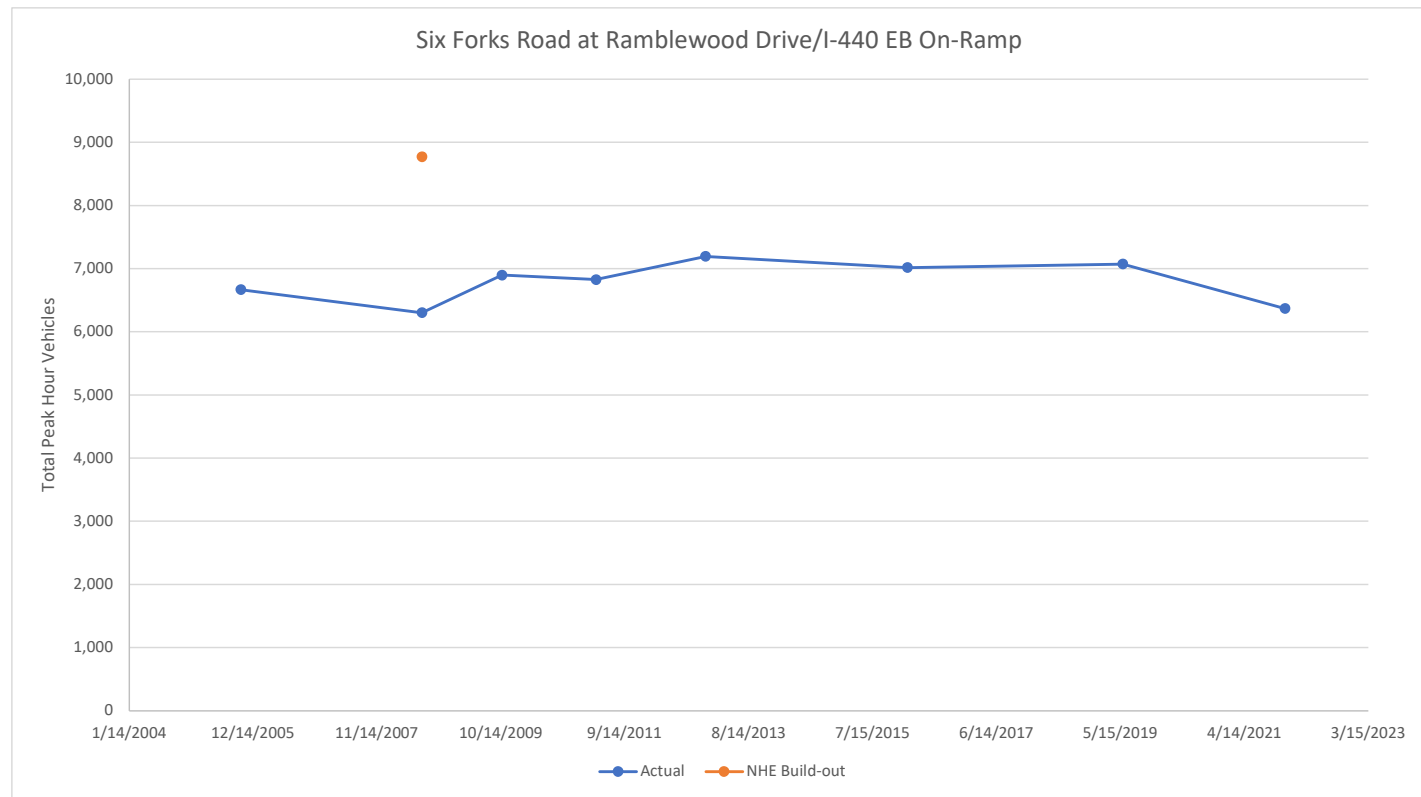
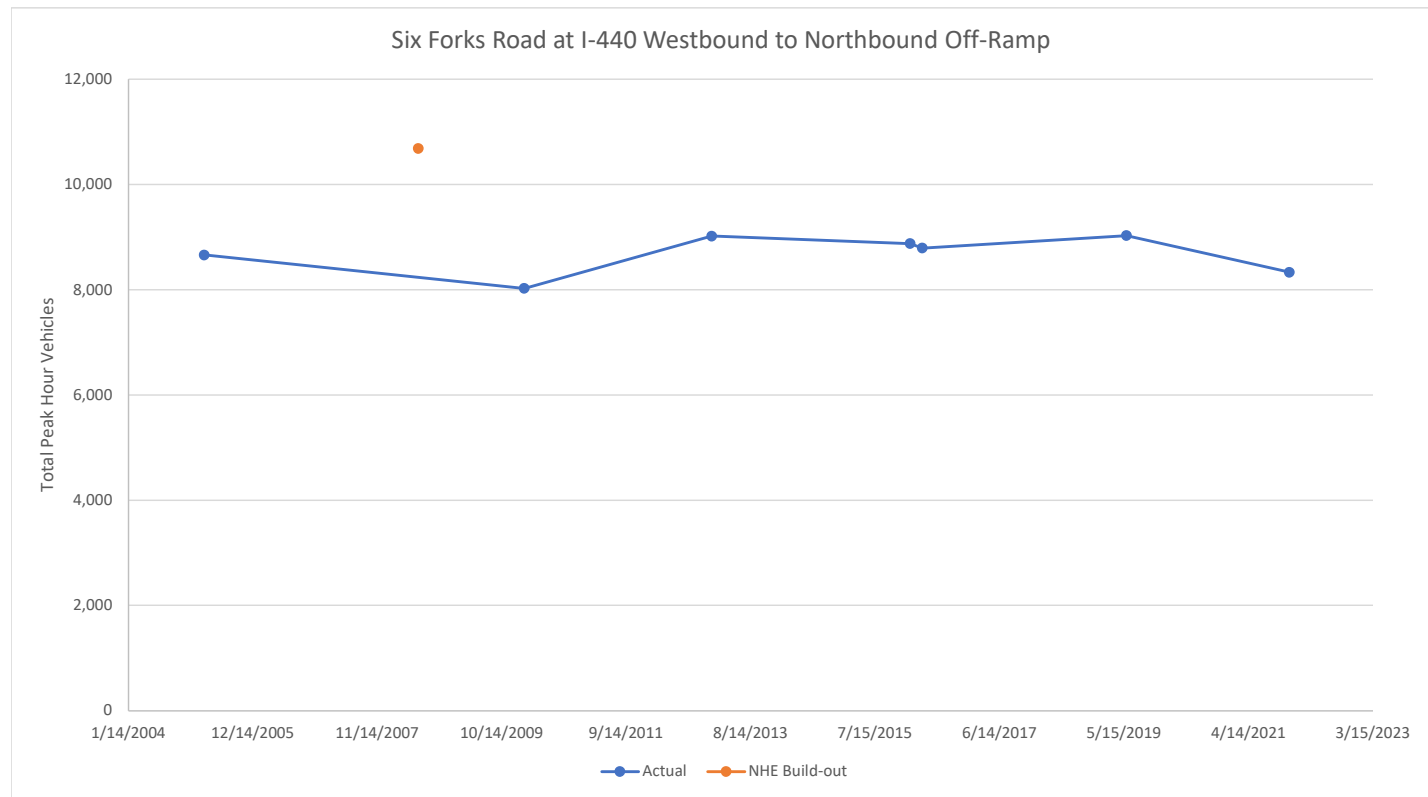
# Peak Hour (Combined AM & PM) Intersection Traffic Volume Comparisons



**Legend**

- Actual count data
- Total Peak Hour Traffic Projected from North Hills East TIA

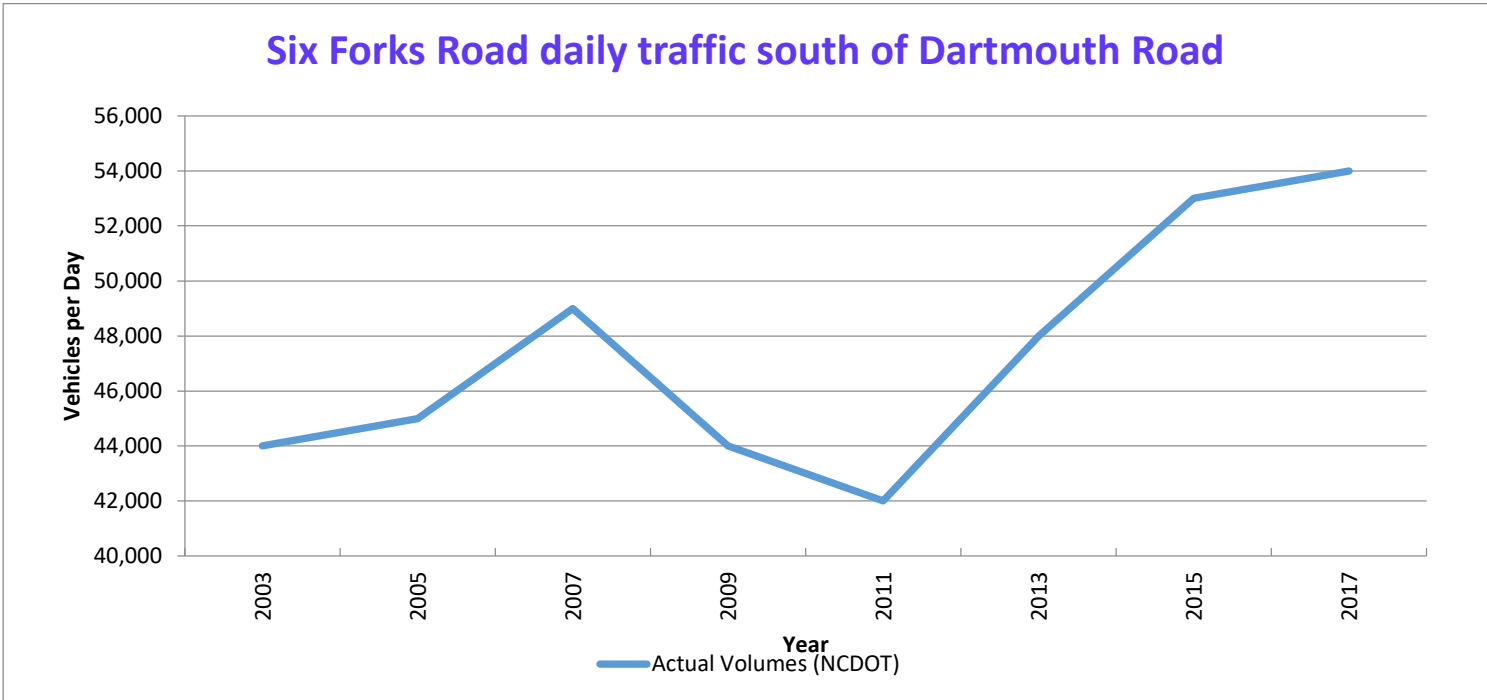
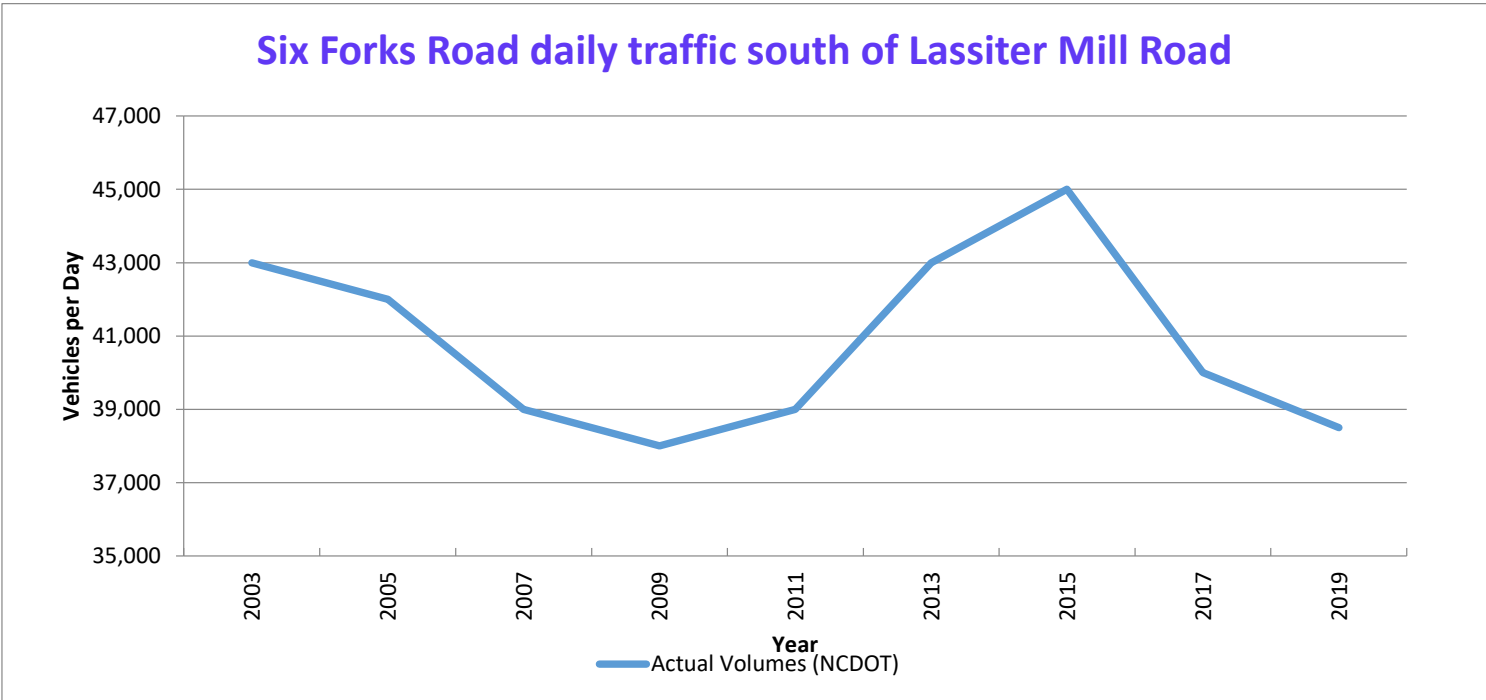
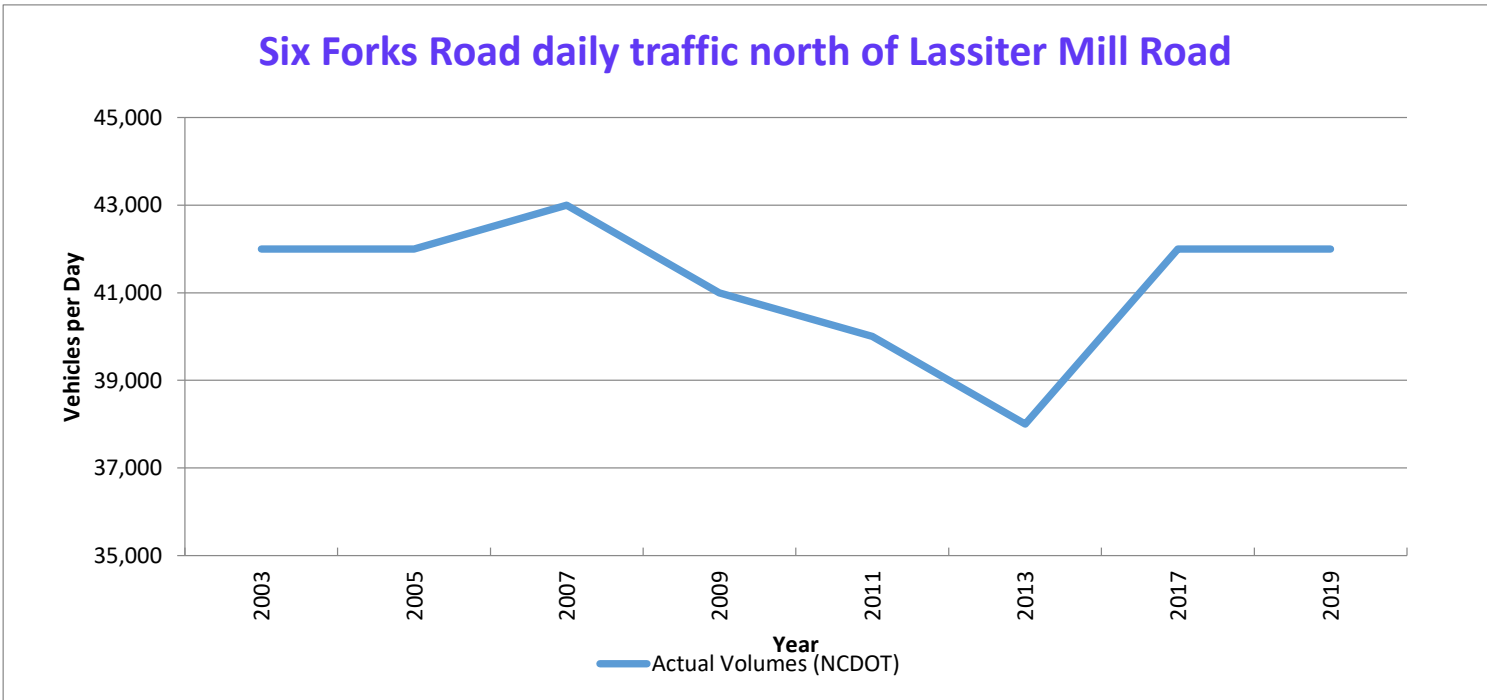
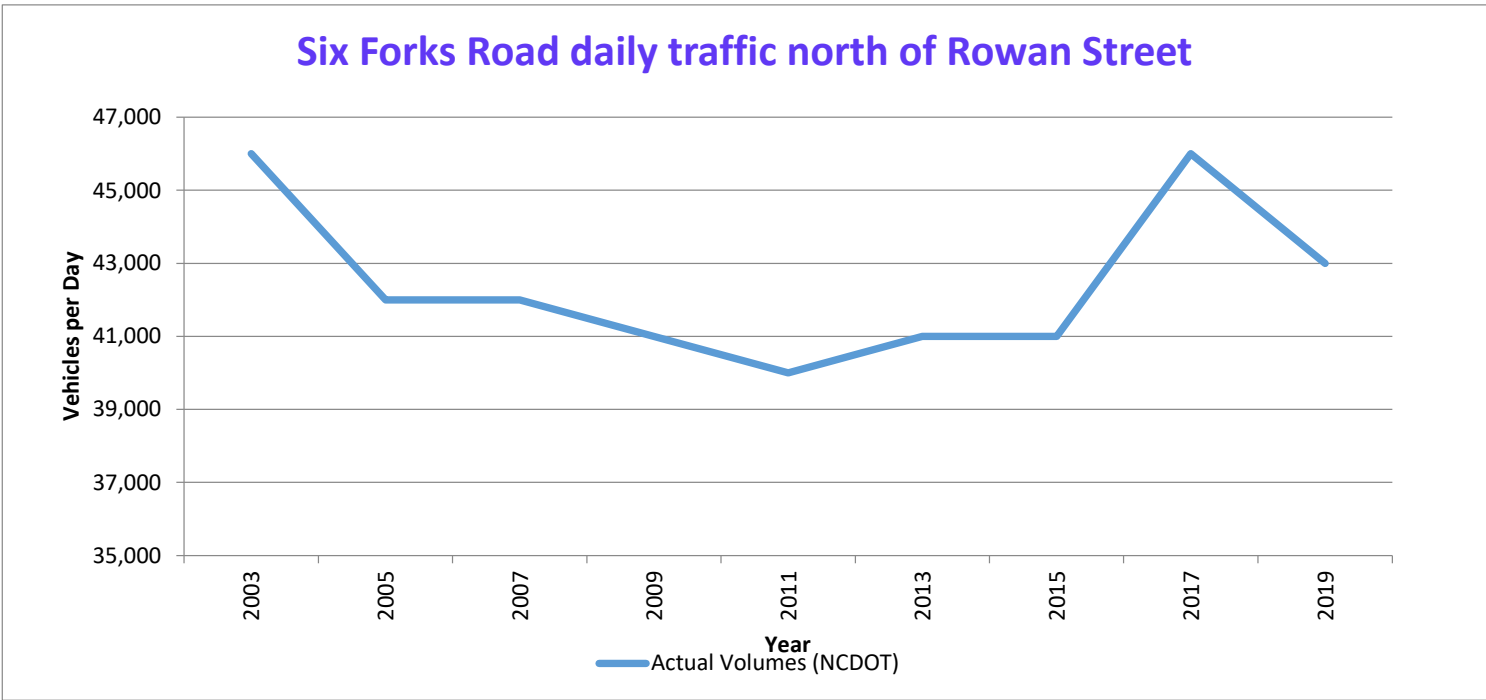
# Peak Hour (Combined AM & PM) Intersection Traffic Volume Comparisons



**Legend**

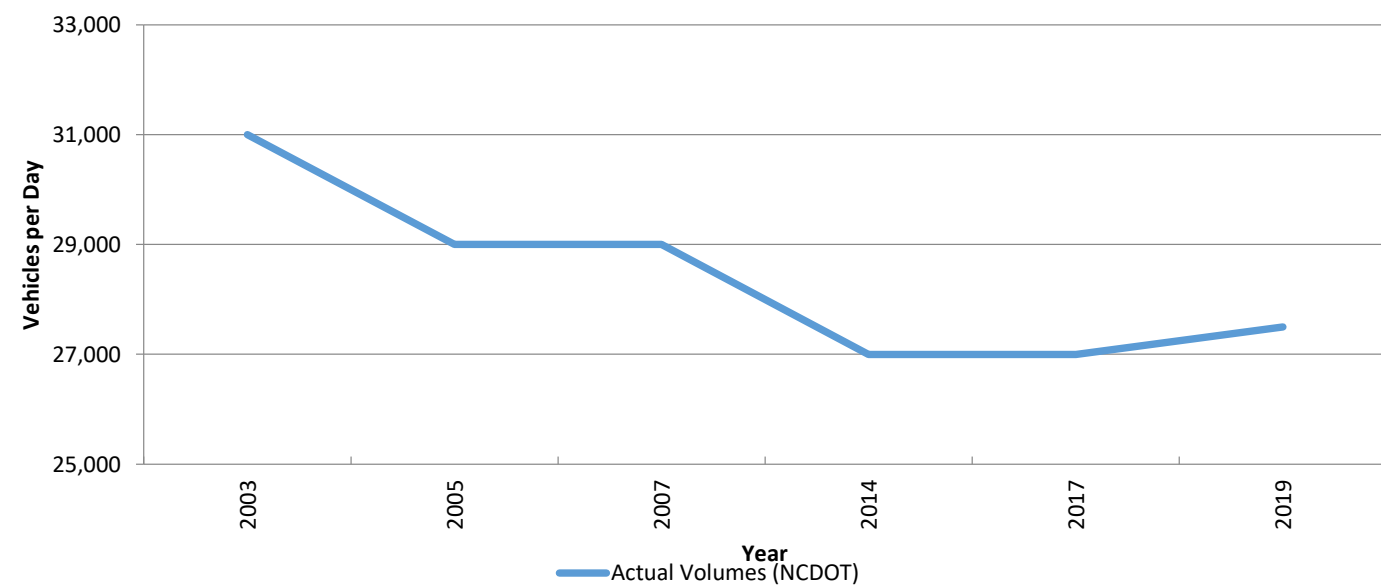
- Actual count data
- Total Peak Hour Traffic Projected from North Hills East TIA

# Daily Traffic Volumes from NCDOT



# Daily Traffic Volumes from NCDOT

## Six Forks Road daily traffic south of I-440



## Lassiter Mill Road daily traffic west of Six Forks Road

